

H-2 ROAD SURFACE DRAINAGE

PURPOSE & APPLICATIONS

Effective drainage is critical to the stability and longevity of a gravel road. Good drainage requires removing runoff from the road surface and get it off as quickly as possible other wise it can lead to washouts, muddy conditions and potholes. Besides a well-constructed road with proper crowning and grading and stable road ditches, road surface diversion or waterbars are needed to direct the runoff off the road surface.

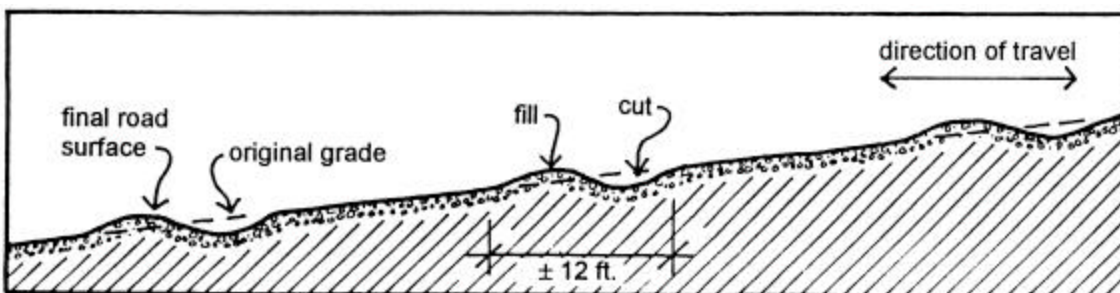
Ideally, road runoff should be discharged uniformly off the road surface, resulting in sheet flow into a grassed or wooded area where it will gradually percolate into the ground without creating channels or causing erosion. The main purpose of waterbars is to reduce the quantity of stormwater flowing over the road and reaching the bottom of the hill. Waterbars should be located so that they gradually transfer stormwater from the road surface to a side ditch and buffer following the contours of the land. These should be installed frequently enough to prevent large volumes of runoff and more water bars are necessary on steeper slopes to counteract the effect of fast-moving water.

CONSIDERATIONS

If no ditch is present, the waterbars should have a flared end section that is level and lined with rock to spread out the flow. The level lip of this device converts the channeled flow from the water bar into shallow sheet flow just before it discharges into the vegetated area. (Sheet flow has far less erosive potential than channeled flow, because the water is moving more slowly.) Waterbars are beneficial, because they disperse runoff before it can cause erosion (if located frequently enough).

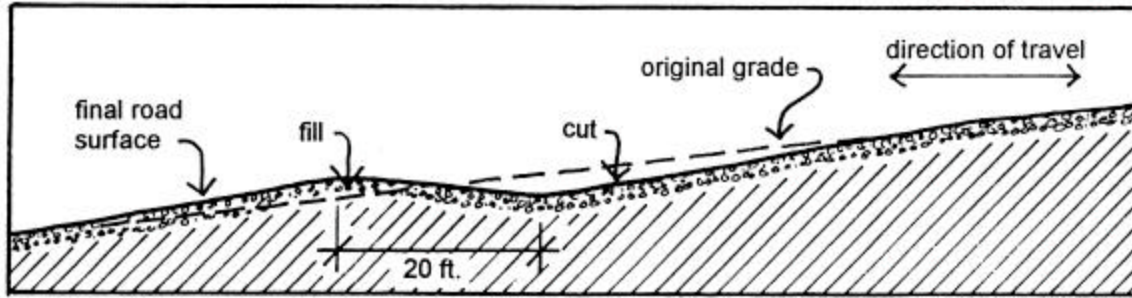
Water Bars and Broad-Based Dips

Water bars and broad-based dips can be used on roads and driveways to divert water off the road surface during a storm. A water bar is a ridge (like a speed bump) that runs diagonally across the road, typically at a 30-degree angle. The ridge stops water from running down the road, and diverts it to the side. Place water bars at frequent intervals to prevent significant water flow on the road.



WATER BARS

A broad-based dip accomplishes the same result as a waterbar by using a shallower depression. These devices can be an economical means of getting water to drain off the road. Water bars are easy to construct, but may be inappropriate for roads with frequent daily traffic. Broad-based dips are more appropriate for use on year-round roads but they can't be used on steep slopes. Broad-based dips may however cause safety concerns if sufficient water accumulates that they result in ice formation on the road surface.

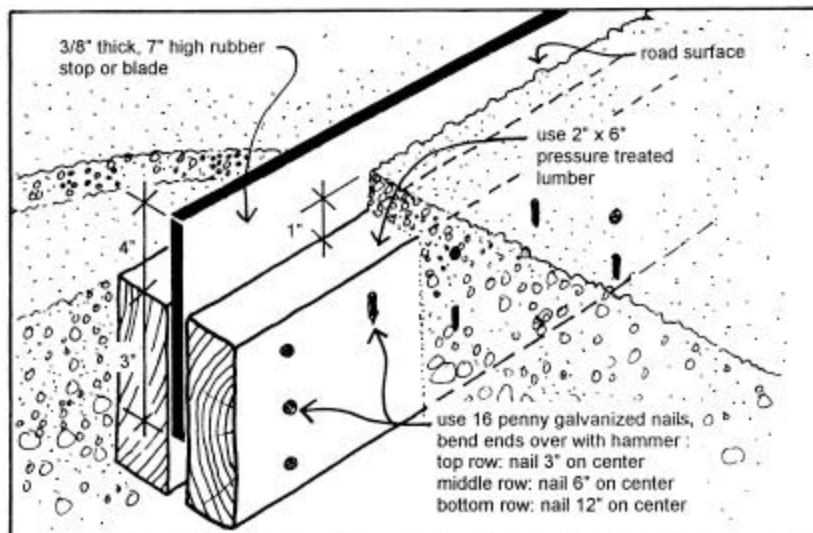


BROAD-BASED DIP

Spacing For Water Bars And Broad-based Dips	
Road/Trail Grade (%)	Water Bar Spacing (feet)
2	250
5	135
10	80
15	60
20	45
30	35

Rubber Bars

Rubber bars can also be used to divert water off sloping sections of a road and can take the place of a water bar. The rubber bar protrudes above the road surface high enough to intercept and collect water, while allowing traffic to pass over it. This device is used generally on seasonal roads or driveways because the bars are prone to snowplow damage. The rubber for this type of device can be found in some hardware stores and is typically cut from an old conveyor belt.



Open-top Culverts

Open-top culverts are an alternative often used in logging operations, but can also be used on camp roads. These box-like structures collect and divert road surface runoff away from the road. They are seldom recommended for year-round roads due to the likelihood of snowplow damage. Open-top culverts can be constructed of logs or from sawn lumber and if constructed of pressure treated lumber, they can last for many years. Open-top culvert must be set 30° downslope perpendicular from the road cross-section and must drain into a stable vegetated buffer. They need to be cleaned regularly to remove sediments, gravel, leaves, and twigs; but winter snowplowing can easily destroy this type of culvert.

